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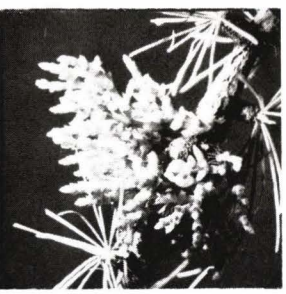

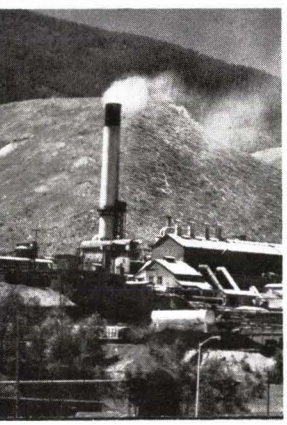

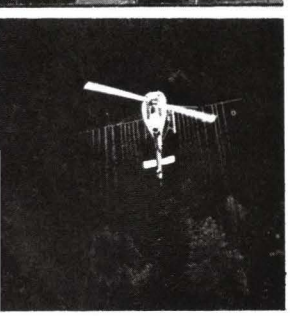

FOREST INSECT & DISEASE MANAGEMENT

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EVALUATION OF MOUNTAIN PINE BEETLE INFESTATION LAP, COOL, AND CARIBOU DRAINAGES YAAK DISTRICT, KOOTENAI NATIONAL FOREST - 1976

by

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ABSTRACT

Mountain pine beetle infestations developed to epidemic level in lodgepole pine stands on the Yaak District in 1972. Approximately 56,282 trees were killed from 1973 to 1975. By 1975, 2,068 ha were infested. This increased to 7,138 ha in 1976, representing a threefold increase. Current infestation occurs on 13 percent of the area risk rated high and given Priority 1 rating for management. Selective logging to remove infested and susceptible trees is in progress and it is recommended that these practices continue to reduce the infestation to endemic levels.

INTRODUCTION

Mountain pine beetle, *Dendroctonus ponderosae* Hopk., infestations developed to epidemic status in lodgepole pine, *Pinus contorta* var. *latifolia* Engelm. in Lap, Caribou, and Cool Creek drainages, Yaak District, Kootenai National Forest, (figure 1) in 1972. From 1973 to 1975, approximately 56,282 trees were killed containing more than 30,284 cu m (Hamel and McGregor 1976).

Hazard ratings of lodgepole pine stands on the Yaak District in 1975 (Hamel and McGregor 1976) indicated that 47,894 ha were risk rated high and given Priority 1 rating for management. At that time 2,207 ha or 5 percent of the area classified Priority 1 was infested.

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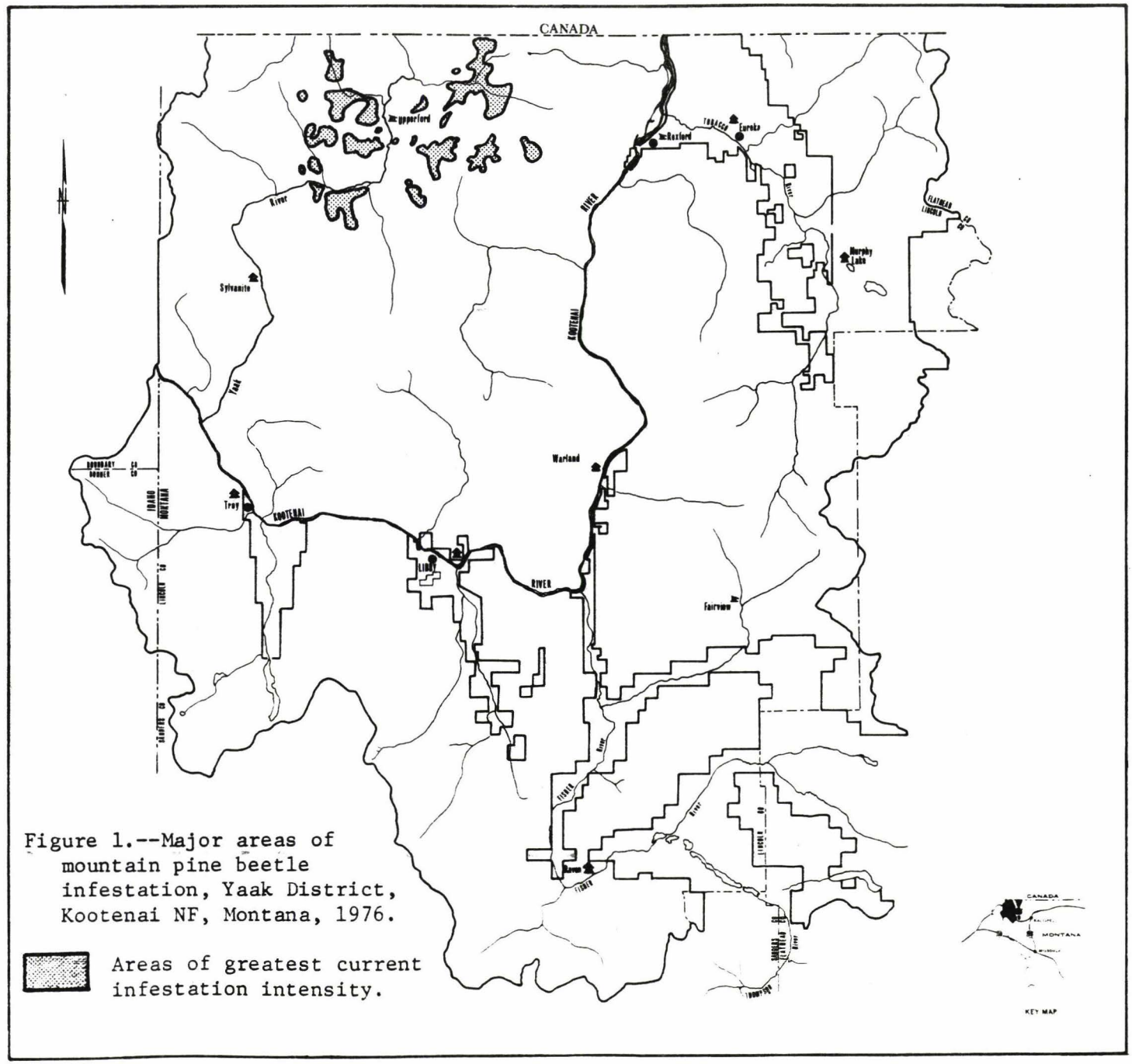

Figure 1.--Major areas of mountain pine beetle infestation, Yaak District, Kootenai NF, Montana, 1976.

Areas of greatest current infestation intensity.

Since the 1975 surveys, 1,451 ha of high risk timber have been harvested.[1/] Twenty-two percent of this was infested at time of removal.

In 1976, aerial surveyors mapped 7,138 ha of mountain pine beetle infestation on the Yaak District. This represents 13 percent of the total area classified Priority 1, or a 1:3 buildup in area infested. In December 1976 and January 1977 ground crews evaluated infestations in Lap, Caribou, and Cool Creek drainages. Purpose of the evaluations was to determine buildup ratios, estimate number of infested trees, and to alert the District to any changes in infestation trend.

METHODS

Estimates of number of infested trees were obtained by establishing forty 1/10-ha plots at 100 m intervals in three infested drainages. Hypsometers were used to determine if trees fell within plot boundaries. Infested trees 12.7 cm d.b.h. and larger were recorded by diameter at breast height (d.b.h.) and categorized into the following classes:

0 = green, uninfested.

1 = 1976 attack, green or partially faded foliage, brood in cambium, blue stain present.

2 = 1975 attacks; red foliage, brood emerged.

3 = 1974 or prior attack; majority of needles dropped.

4 = unsuccessful attack or pitchout; green foliage, pitchtubes present, brood and blue stain absent.

In addition, twenty 1/25-ha plots were established to determine tree diameter-phloem distribution within the residual stand. Hypsometers were used to determine trees to be tallied within plots. Each tree tallied was recorded by d.b.h., and two phloem samples were removed with a hand axe from opposite sides of each of two trees per diameter class per plot. Phloem thickness was measured to the nearest 0.25 mm with steel rulers.

1/ Personal communication (2/18/77) Larry Michalsky, Silviculturist, Yaak District, Kootenai NF.

RESULTS

Stands in areas surveyed are mixed, with lodgepole pine comprising between 28 and 47 percent (Table 1).

Table 1.--Green stand composition, Yaak District, Kootenai National Forest, 1976

Area	Tree species*	Percent of stand	Mean d.b.h. (in cm)	Trees/ ha	Mean phloem thickness (in cm)
Lap Creek	LPP	28	24.9	136	0.17
	L	33	22.4	161	--
	S	22	16.5	106	--
	Cdr	5	26.2	25	--
	Hem	8	17.0	37	--
	DF	3	17.8	12	--
	WWP	1	12.7	7	--
Caribou Creek	LPP	35	23.9	54	0.12
	L	30	16.0	47	--
	S	25	24.6	40	--
	DF	5	25.4	7	--
	SAF	3	15.2	5	--
	Hem	2	12.7	2	--
Cool Creek	LPP	47	26.9	183	0.16
	L	44	19.6	168	--
	S	9	17.0	35	--

*Tree species: LPP, lodgepole pine; L, larch; S, spruce; SAF, subalpine fir; Cdr., Cedar; Hem., hemlock; DF, Douglas-fir; WWP, western white pine.

Number of 1976 infested trees ranged from a low of 33.9 per ha in Lap Creek to 58.3 and 76.1 per ha in Caribou and Cool Creek drainages respectively (Table 2).

Table 2.--Summary of infested stands surveyed, Yaak District, Kootenai National Forest, 1976

Area	Infested trees/ha	Mean d.b.h. of attacked trees (in cm)	Buildup ratio from 1975 to 1976
Lap Creek	33.9	28.4	1:1.3
Caribou Creek	58.3	27.7	1:0.8
Cool Creek	12.5	25.4	1:1.8

Buildup ratio of old to newly attacked trees for the combined areas was 1:1.0 from 1974 to 1975, and 1:1.3 from 1975 to 1976. Buildup ratios of old (1975) to newly attacked trees ranged from 1:1.3 in Lap Creek, to 1:0.8 in Caribou Creek, to 1:1.8 in Cool Creek. Mean buildup ratio was 1:1.3 for all areas surveyed. Tree mortality in 1976 occurred in all diameter classes from 12.7 to 45.7 cm d.b.h. with greatest mortality in the 17.8- to 35.6-cm d.b.h. size classes (table 3). Diameters of infested trees averaged 28 cm through the period.

Table 3.--Percent infested trees by diameter class, Yaak District, Kootenai National Forest, 1976

Area	Year	D.b.h. size class (in cm)													
		12.7	15.2	17.8	20.3	22.9	25.4	27.9	30.5	33.0	35.6	38.1	40.6	43.2	45.7
		Percent by year													
Lap	1976	-	-	4	-	8	29	17	17	13	4	8	-	-	-
	1975	-	-	-	6	6	6	17	21	21	11	6	6	-	-
	1974	-	-	-	6	11	-	6	27	27	17	6	-	-	-
	1973	-	-	2	6	11	17	13	14	19	7	5	5	2	-
Caribou	1976	-	2	2	9	10	18	19	24	11	3	1	1	1	-
	1975	-	-	2	8	9	14	21	22	11	8	2	-	2	1
	1974	-	-	1	7	13	13	17	12	12	13	7	2	2	2
	1973	-	-	5	11	-	16	11	21	16	11	-	10	-	-
Cool	1976	1	-	8	16	18	19	19	5	6	3	3	-	1	-
	1975	-	-	5	2	10	15	24	24	10	5	2	2	-	-
	1974	-	-	4	15	17	15	21	6	8	8	6	-	-	-
	1973	-	-	-	-	11	11	11	11	33	15	7	-	-	-

Mean diameter of the remaining lodgepole pine stand is approximately 25 cm with a mean phloem thickness of 0.15 cm.

DISCUSSION

The mountain pine beetle infestation on the Yaak District began in 1972 and more than doubled in intensity by 1975 (Hamel and McGregor 1976). In areas surveyed, average number of infested trees per ha increased from 47 in 1975 to 57 in 1976.

Data from past epidemic infestations indicate that certain factors such as phloem thickness, tree diameter, stand density and elevation, age, habitat type, and weather directly influence stand susceptibility to mountain pine beetle infestation (Amman et al. In Press; Cole 1973; Safranyik et al. 1974). These factors have been used for hazard rating lodgepole pine stands in British Columbia (Safranyik et al. 1974). A map extending this concept was prepared by the Kootenai National Forest in 1975 (Hamel and McGregor 1976). Hazard ratings were prepared for areas supporting significant lodgepole pine stands.

As a result of this hazard rating system, approximately 47,894 ha were categorized high risk for mountain pine beetle infestation and given first priority for management. In 1975 there were 2,068 ha infested within the boundaries of the Priority 1 rated area. In 1976 the area infested increased to 7,138 ha. Infestation now covers 13 percent of the area rated Priority 1.

Some investigators (Amman and Baker 1972) have concluded that the proportion of other tree species would need to be considerably more than 36 percent in the elevational zone of optimal beetle development for lodgepole pine in a mixed species forest to be less susceptible to mountain pine beetle damage. In drainages surveyed, 60 percent or more of the stands are composed of species other than lodgepole pine; however, this greater mixed species composition is not expected to alter the infestation trend. The large percentage of mature (56% $\geq$ 30 m) western larch occurring in the areas are, in fact, dominating the smaller (12% $\geq$ 30 m) lodgepole pine (Hamel and McGregor 1976) and probably contributing to tree stress resulting in greater susceptibility to beetle attack.

RECOMMENDATIONS

The most effective method of suppressing mountain pine beetle is through a combined program of logging infested trees and timely silvicultural treatment to remove or reduce the inventory of large diameter, highly susceptible trees (Amman et al. In Press).

Suppression efforts were initiated on the Yaak District in 1975. In 1976, 1,451 ha of high risk timber were harvested. More than 323 ha, or 22 percent of this, were infested at the time of removal. Additional sales totaling 973 ha were offered in 1976 including a total of 872 ha in the Lap, Caribou and Cool drainages. The Yaak District proposes to sell 516 ha of high risk and beetle-infested timber in calendar year 1977. An additional 419 ha are programed for harvest in calendar year 1978.

It is recommended that these harvesting plans continue to remove and reduce mountain pine beetle susceptible trees.

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